EFFECTS OF BDNF ON DOPAMINERGIC NEURONS IN DISSOCIATED AND FREE-FLOATING ROLLER TUBE CULTURES OF HUMAN FETAL VENTRAL MESENCEPHALON

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Brain derived neurotrophic factor BDNF was tested for its ability to influence survival and neuronal structure of dopaminergic neurons in dissociated and in free floating roller tube (FFRT) cultures of human fetal ventral mesencephalon. Dissociated cultures were established from 5 different embryos, 8 to 9 weeks post conception and maintained in vitro for 7 days. Following immunocytochemistry for tyrosine hydroxylase cell counting of all immunoreactive (ir) cells was performed. Neuronal structure was analysed by computer assisted three-dimensional reconstructions of uniform randomly chosen TH-ir neurons cultured with 50ng/ml BDNF (n=120) and neurons cultured without BDNF (n=80). Cell counting and determination of fibre density of TH-ir neurons in FFRT cultures was carried out in 147 tissue sections of 147 cultures from 10 different embryos, 6 to 12 weeks post conception).

BDNF increased survival of TH-ir neurons in dissociated cultures and in free floating cultures by 76% and 96% respectively. Neuronal structure was increased in dissociated cultures as evidenced by increases in mean soma size by 18%, number of branch points and segments by 95% and 40% respectively, combined neuritic length and volume by 60% and 126% respectively, and maximal branch order by 25%. Effects of BDNF on tree complexity in dissociated cultures were confirmed in FFRT cultures by a relative increase in fibre density by 34% on a per neuron basis. These results show that BDNF can improve survival and influence development and differentiation of dopaminergic neurons of human fetal ventral mesencephalon in various in vitro models.

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